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ABSTRACT

This paper reviews the literature on the use of dental auxiliaries (hygienists, assistants, and laboratory technicians). The dentist may increase his productivity by employing more auxiliaries and by delegating more tasks to them. Even though state laws and rules are becoming more liberal in allowing the dentist to delegate tasks to his auxiliaries, some restrictions on the use of hygienists and assistants still remain, with more revised laws prohibiting the delegation of restorations. Surveys of dentists have shown that while they appear to be receptive to the use of expanded duty assistants (EDA), they resist any delegation of technical duties because the dentists enjoy performing them. It may be that only when faced with an acute increase in demand for their services that dentists will be willing to increase the quantity of auxiliaries and to delegate more duties to them. This assumes that dentists will not be willing to work substantially greater hours in response to increased demand. Table 1 in the introduction shows that this has been the case in the past. A 44-item bibliography is included. (Author/PG)

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ATTITUDES AND APPROACHES TO DENTIST'S
USE OF ASSISTANTS:

A LITERATURE REVIEW

by Ann Webster

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I. INTRODUCTION.

In 1969 it was estimated that 45% of the population had visited a dentist during the past year and that 13.3% of the population had never seen a dentist. Of those who have never seen a dentist, a high proportion are children under 17 (35.3%).³⁴ It is also estimated that there are one billion unfilled cavities in the United States and that all adults have some form of periodontal disease.⁴⁰ If these estimates are accurate, the oral health status of the population of the United States could be improved, but how could this be achieved?

Perhaps the present state of oral health exists because of a shortage of dental manpower or perhaps the problem is one of maldistribution. In either case, as shall be shown in this section, substantial increases in the supply of dental services can be achieved, rather economically and quickly, by the increased use of auxiliaries without deterioration in the quality of care. In later sections factors are examined which prevent the delegation of more tasks to auxiliaries. These factors include educational, legal, and psychological barriers.

The dental profession utilizes three auxiliaries: hygienists, assistants, and laboratory technicians. The hygienists are the most highly trained auxiliary and are licensed in every state. However, most recent studies of the use of ancillary personnel in dentistry have concentrated on the expanded use of the lesser trained dental assistants.

A dental assistant may be certified by the Board of the American Dental Assistants Association after completing one year of training in an American Dental Association approved school and after passing an examination.

This certificate must be renewed annually through continued education.²² However, it is estimated that of the 90-95,000 dental assistants employed in 1972, only 16,000 belonged to ADAA; most dental assistants are on-the-job trained.¹⁵

Little attention has been given to the utilization of the laboratory technician, so they are not discussed in this paper. It seems likely in the future that these auxiliaries will be delegated more tasks. In 1972 the ADA Inter-Agency Committee recommended that research be done on the technicians' potential for performing additional functions in the dental office.³⁸

A. Auxiliaries Increase Productivity and Income.

From 1955 to 1970 the output of dentists measured by patient visits increased by 20%. As can be seen in Table 1, during this same period the percentage of independent dentists employing full-time assistants increased from 56.8% to 79.2%. The percentage employing full-time hygienists and secretaries has increased from 4.4% to 15.8% and from 10.7% to 34.2% respectively. The smallest increase is in the employment of full-time technicians which increased from 3.2% to 4.3%. As can be seen in Table 1, the hours worked by the dentist has been held fairly constant during this period; the increased production appears to be due to the increased use of auxiliaries.

Another index of a dentist's productivity is his income. The ADA Survey data indicate substantial increases in a dentist's income with increased use of auxiliaries (see Table 2). In 1970 dentists who employed no auxiliaries had a mean gross income of \$31,571. The employment of one

TABLE 1

INCREASED PATIENT VISITS AND USE OF AUXILIARIES

% of Dentists Employing
Full-Time Auxiliaries

Year	Mean Patient Visits	% Increase in Patient Visits Since 1955	Weekly Hours in Office	% Decrease in Hours Worked Since 1955	Assistants	Hygienists	Secretaries	Technicians
1970	3,565	20%	41.4	-4.1%	79.2	15.8	34.2	4.3
1967	3,585	21%	41.9	-3.0%	83.5	12.4	27.2	4.2
1964	3,343	13%	43.2	---	78.0	11.0	23.6	4.0
1961	3,149	6%	42.8	-0.9%	68.3	5.8	13.4	3.1
1958	3,130	6%	43.1	-0.2%	65.6	6.5	10.7	3.5
1955	2,977	---	43.2	---	56.8	4.4	*	3.2

Source: ADA Survey of Dental Practice, 1956, 1959, 1962, 1965, 1968, 1971.

*Data not available.

TABLE 2

INCREASED INCOME AND AUXILIARY EMPLOYMENT

1970

Full-Time Auxiliaries Employed	Mean Gross Income of Dentists	% Increase in Gross Income
0	\$31,571	0%
1	42,039	33%
2	60,566	92%
3	82,496	161%
4	91,703	200%

Source: ADA The 1971 Survey of Dental Practice.

full-time auxiliary increased the mean gross income by 33% (\$42,039). Two, three, and four full-time auxiliaries increased the income by 92% (\$60,566), 161% (\$82,496) and 190% (\$91,703).⁵ Such increases in income should easily offset the cost of employing the auxiliary and overhead costs.

B. Expanded Duties for Assistants.

During the last decade, there have been several studies of increased productivity through the use of expanded duty assistants (EDAs). These studies concentrate on the lesser trained assistant, though it appears, as shall be described later, that hygienists are also performing more tasks. The following studies indicate that increased productivity is dependent not only on increased numbers of auxiliaries, but also upon the utilization of expanded skills.

1. Dental Manpower Development Center, Louisville, Kentucky. This three-year project indicated that a dentist working with four EDAs can increase the number of procedures performed by 130% over a dentist working in a conventional manner with one chairside assistant. The dentists delegated about two-fifths of their work to these auxiliaries. The delegated functions included: alginate impression, matrix placement, amalgam or synthetic placement, carving and polishing of amalgam restorations, and finishing of synthetic restorations.^{28,29} After a year of training in expanded functions, the assistants' quality of work was comparable to the dentists' (82% compared to 83% assessed as acceptable), although the assistants required 40% more time than the dentists to complete procedures. The patients expressed a high degree of satisfaction

with the dental work.

The authors believe that work is needed in several areas: (1) More study of the training needed by the assistants to perform expanded functions. (2) Further exploration of the optimum number and type of EDAs in a dental team. (3) More study of the utilization of EDAs in a private practice setting, particularly the use of one or two EDAs. (4) The economic aspects of using EDAs in private practice, including the cost to the patient and the effect on dentists' expenses and income. (5) More information about the attitudes of patients and doctors toward EDAs in private practice.

2. University of Alabama. The 1967 report of this project did not emphasize increased output through the use of EDAs. It concentrated on the quality of work of EDAs. It was found that high school graduates with two years of training could perform many procedures as well as undergraduate dental students. These tasks included: placing rubber dams and matrix bands; inserting and finishing temporary fillings; condensing and carving amalgam restoration; placing silicate restorations; and finishing and polishing amalgam and silicate fillings.¹⁸

In a later study the work of EDAs was compared to that of dentists. Six clinical procedures were investigated: inserting amalgam and silicate restorations, finishing amalgam and silicate fillings, inserting temporary fillings, and placement of matrix bands. The work was examined by private practitioners who were not aware of whether the procedures had been done by a dentist or an EDA. The quality of work done by the EDAs was found to be comparable to that of dentists. (Total procedures assessed 9).

Excellent: EDAs 69.4%, Dentists 69.1%; Acceptable: EDAs 28.8%, Dentists 28.5%; Unacceptable: EDAs 1.8%, Dentists 2.4%.)¹⁹

Because there has been little study of the impact of the use of EDAs on the income of the private practitioner, a surrogate practice was set up at the University of Alabama. The EDAs used in the project had completed a 42-week training program. The study focused on the productivity, revenue, cost, and income of Team A (one dentist and two chairside assistants) and Team B (the same dentist, one EDA and three chairside assistants). The project used economic incentives similar to those which function in private practice. If a dentist or auxiliary produced more, he was paid more. If the dentist wanted more personnel or equipment, his income suffered in the short run. If the auxiliaries did not perform efficiently, the dentist's income was affected.³⁶

With the addition of one chairside assistant and one EDA, Team B increased its revenue by 37%, increased the number of patients seen by 20.6%, and increased the number of services provided by 26%. There is some question about whether or not the results in this surrogate practice are directly applicable to private practice, but they do substantiate the increases in patient visits and dentist income discussed in Section I.

3. University of Minnesota. The most productive team in this study consisted of one dental student, one EDA and two chairside assistants. This team exceeded the number of procedures performed by a dental student and an assistant by 51.5%. The results of this study may have been affected by the fact that dental students rather than dentists were used.⁸

The quality of the work done by the auxiliaries with one year of training was consistently as good as that of the dental students. As a

group, the EDAs were superior in the performance of prophylaxis, removing matrixes, and placement of Class I amalgam restorations.

This study also included an opinion survey of students participating in or observing the teams. In general, the students believed the duties of the auxiliary should be expanded, but 8 of the 103 students were opposed both before and after the study. Most students believed that duties such as manipulation of rubber dams, matrixes and wedges could be performed by a trained assistant. The opinions on the controversial issues of the delegation of manipulation of amalgam, and adaptation and cementation of stainless steel crowns were changed to favor such delegation at the end of the study. The author suggests that education efforts need to be directed toward dental students, teachers, and practitioners.

4. Philadelphia Department of Public Health. This program for dental care was initiated in 1969. The most efficient dental teams in this project were composed of one dentist, three EDAs (or "technotherapists"), two assistants and a clerk. The EDAs are assistants who have received six months additional training. ⁴⁰

Soricelli believes that one such team is providing more care than could be provided by four dentists who each work with a dental assistant. Working full-time, the "technotherapists" in this project were able to complete 33% more fillings than the dentist. Qualitatively, as well as quantitatively, the EDAs surpassed the dentists. Their performance was assessed as being 20% better than the dentists. The Average Quality Point score for the EDAs was 3.539 compared to the dentists' average of 2.925.

Public acceptance of the team approach is evidenced by the fact that

before the project was begun the broken appointment rate was near 60% and after a few months it had been reduced to almost zero. Soricelli believes that the greatest impediment to the use of such teams in private practice will be the reluctance of the dentists to delegate tasks rather than in the public's acceptance.

5. Indian Health Service. Since the Indian Health Service is unable to financially maintain a large staff of dentists, it is essential that the dentists' training and skills be used effectively. The Indian Health Service assistants either were allowed to perform, or think it is appropriate that they perform, the following procedures: place rubber dam and matrixes; apply topical medications; make preliminary and study impressions; place and change dressings; remove sutures; place and remove gingival packs; remove excess cement; and finish synthetic restorations.²⁶ For several years the Health Service has experimented with EDAs. A study in 1965 indicated that assistants with eight weeks of training could place restorations of a quality comparable to dentists.¹

A more recent study has confirmed the quality of restorations by assistants with twelve weeks of training. In fact, the percentage of alloy restorations judged acceptable for the EDAs (69.5%) was greater than for the dentists (58.8%). The quality of silicate restorations was virtually the same (80.0 and 80.5 judged acceptable).²

The most efficient ratios for dental teams was also investigated. A team composed of one dentist, 1.5 EDA, and chairside and roving assistants served as a control group and in each of three phases an additional EDA was added to the team. The most efficient team was in

the second phase, three EDAs. The use of more EDAs appeared to be inefficient because there was insufficient demand for services (the team had already overcome the backlog of need) and because the dentist was unable to supervise work at a faster rate. Speed among dentists would, of course, vary considerably.

Increased numbers of patients were treated and an increase was noted in primary preventive services, fluoride treatments and prophylaxis, and secondary preventive services, restorations and periodontal treatments. The increase in these preventive services would result in decreases in dental disease and thus improve the oral health status of a community.

Abramowitz and Berg point out that the use of EDAs could both increase the income of the dentists and decrease the cost to the patient. Besides lowering the cost for each service, the EDA would improve oral health and, therefore, lessen the demand for prosthetic appliances. Prosthetic services are more costly to the dentist than other services because of the associated laboratory fees.

6. Great Lakes Naval Training Center. This Center has been experimenting with EDAs for several years. The assistants in this study have a 16-month Technician Training Course and a 5-week course in expanded duties. The team of one dentist and four EDAs using three chairs was found to be most efficient. This team treated twice as many patients as a team of one dentist and two EDAs using one chair. A team of one dentist and five EDAs using four chairs was also experimented with, but was found to be too taxing for the dentist and scarcely more efficient than the team with four EDAs.

Experimentation in the university or governmental setting has consistently demonstrated that increased productivity results from the use of EDAs. However, no studies have been done which determine the effect of the EDA on the output and income of the dentist in the private sector. Pelton's study³⁶ of a surrogate practice comes closest to this, but more study needs to be done. The composition of the most efficient team in private practice should also be studied. Teams with three or four EDAs were most efficient in the studies discussed, but factors such as costs of equipment and overhead, the type and location of the practice, and the problems of patient queuing will affect the team ratios used in private practice and, therefore, the increase in treatments provided.

II. TRAINING DENTISTS TO USE AUXILIARIES--DENTAL AUXILIARY UTILIZATION (DAU) PROGRAM.

In the mid-1950's the Department of Health, Education and Welfare began the DAU program on a pilot basis. The purpose of this program was to train dental students in the effective use of chairside assistants. Chairside assisting consists of such tasks as: selecting instruments, changing burs and stones for cavity preparations, passing hand instruments, and keeping field clear during carving of restorations and during placement of fillings.³⁹

By 1961 the DAU program was part of the curriculum of most dental schools, and it is estimated that by 1975, 45% of all practicing dentists will have participated in the program.¹⁷ Though the DAU program has been in existence for nearly fifteen years, there has been little analysis of whether the experience affects the dentists' hiring and use of auxiliaries.

Metz compared the practices of the 1960 graduates of ten schools with DAU programs (U. of Alabama, U. of Illinois, Indiana U., U. of Iowa, U. of Missouri, Marquette U., U. of Minnesota, U. of Nebraska, U. of North Carolina, and U. of South Carolina) and five schools without (Emory U., Medical College of Virginia, Northwestern, Ohio State U., and St. Louis U.). He divided the dentists who had gone through the DAU program into those with little exposure and those with a great deal of exposure.³³

Metz concluded that the graduates with high DAU program exposure were more likely to hire an assistant when they first established a practice (High DAU Exposure--79%, Low DAU Exposure--68%, None--69%) and also were more likely to hire an assistant for chairside assisting (rather than office assisting). The high DAU experience dentists tended to have the assistant spend more of her time at chairside and to delegate more tasks.

Metz's results indicate that the DAU program does not have a significant impact upon dentists' behavior. However, Metz sampled dentists who graduated when the DAU program was new, and it is possible that as the programs have improved, they have had a greater effect upon the habits of dentists.

However, Dorfman, et. al. surveyed 121 of the juniors and seniors at the University of California at San Francisco to determine if students who had the DAU course were more favorable towards expanded duties.¹² He found little difference in the ten seniors who had the course and the fifty-five who had not. Mean scores of the two groups were 4.63 and 4.37

respectively. If this study was done after more students had taken the course, perhaps significant differences would appear. It should be noted that both the junior and senior students had very favorable attitudes toward delegation even without the DAU course.

Rosenzweig's survey of Tufts Dental School graduates from the classes 1963 through 1967 focused on an assessment of the DAU program. Fifty-four percent of the respondents believed the program was adequate preparation for working effectively with a dental assistant. Those graduates who employed a single part-time assistant expressed the greatest dissatisfaction with the dental auxiliary program (65% of those dissatisfied) and also indicated a preference for a course to "teach the dental student to utilize the dental assistant." Those graduates who employed one or more dental assistants perceived the DAU program as adequate and preferred a course which would train the dentist and assistant in "methods for working effectively together." Rosenzweig believes that the latter response indicates the dentists have developed the technical skills to work in a team, and are now interested in the less tangible skills.

The effect of the DAU program may be dampened by the career style of the dentist or by the dentist's loss of skills in working with an auxiliary during the period he is setting up practice. Castaldi questions the effectiveness of the program because of its lack of concentrated teamwork. Only the University of Connecticut has a 1:1 ratio of assistants to dental students during the clinical years.¹⁰

Federal support for the DAU program is being phased out and its

future may be in doubt if funding has to be obtained at the state level. A new federal program, Training in Expanded Auxiliary Management (TEAM) Program, was begun in the last few years. This program is based on the DAU experience of dentists and auxiliaries and is designed to train the dental student to develop and manage a dental team.*

III. LEGAL RESTRICTIONS AND AUXILIARY UTILIZATION.

A. What are Expanded Duties.

It has been assumed that one of the major barriers in the past to the expanded utilization of dental auxiliaries has been the restriction of state practice acts. In 1968 Weinstein and Hansen compared state laws and the curricula of a random sample of dental assisting schools to the procedures a sample of Michigan dentists indicated they were willing to delegate.⁴³ A considerable gap between the legal status and curricula for the assistant and the desires of the dentist was indicated. Less than a decade ago, most dental practice acts discouraged or prohibited the dentist from exercising his judgment in delegating tasks to auxiliaries. Many practice acts limited the hygienist to prophylaxis-type duties and taking radiographs, and prohibited her from any other tasks. Until

*The TEAM program encourages experimentation in new uses of auxiliaries. To obtain grants under this new program, dental schools must teach or allow certain procedures as a minimum. These include: preliminary oral exam; exposing and processing radiographs; rubber dam application; primary impression taking; oral prophylaxis; oral health instruction; topical fluoride application; placement, carving, and finishing of temporary, amalgam, resin, and silicate restorations.¹⁷ Originally, the state examining board or the state dental association had to agree that this minimum list of duties could be legally delegated in the state. This would have had great implications for revising states' dental practice acts. Revised TEAM guidelines of October 1970, however, removed this requirement.⁴¹

recently dental assistants were not mentioned in most laws.¹¹ Many state boards expanded duties under such laws by issuing regulations on procedures assignable to the hygienists and assistants, but restrictions and lack of guidelines in the law surely slowed these efforts.

The hygienist's duties have traditionally been in the preventive field. Johnson and Bernstein list her duties as: prophylaxis (scaling and polishing), fluoride application, dental radiographs, and charting dental conditions.²³ Preliminary oral examination and oral health instruction may also be included. The usual duties of the dental assistant are chairside assisting tasks.

Expanded duties for auxiliaries may be grossly defined as tasks other than those traditionally assigned. This is the definition Johnson and Bernstein accept for their 1970 survey. In the 1972 study expanded duties are defined as impressions for study casts, placement of rubber dams and matrices, and removal of sutures and dressings. The federal TEAM project guidelines list the minimum expanded duties to be performed by the auxiliary as follows (specific tasks for hygienists and assistants are not spelled out): preliminary oral exam; exposing and processing radiographs; rubber dam application; primary impression taking; oral health instruction; fluoride application; and placement and carving of temporary, amalgam, resin, and silicate restorations.¹⁷

No guidelines have been laid down by the ADA. However, the ADA Inter-Agency Committee* in its report on guidelines for auxiliary programs has

*This committee is composed of representatives from all areas of the dental field. The national organizations of the dentists, dental educators and examiners, assistants, hygienists, and laboratory technicians are all represented.

suggested assignable tasks. The Inter-Agency Committee suggested that the traditional hygienist duties could be delegated to a certified or formally trained assistant if she enrolled in a continuing education course for these procedures and passed an examination. They also suggested certain procedures traditionally performed by the dentist as examples of expanded functions for hygienists and assistants: placement and removal of rubber dams, matrices, and temporary restorations; placement, carving, and finishing of amalgam, resin, composite, and silicate restorations; and administration of local anesthetic. The Committee proposed that these expanded duties could be performed by the hygienist without additional education and by the assistant with continued education.

In its 1972 report, the Inter-Agency Committee suggested that the value of auxiliaries performing expanded functions has not been adequately tested in the private practice environment. The Committee recommended that a national analysis be undertaken of the tasks delegated to team members in a variety of practice settings and the efficiency and economics of various modes of dental practice. The 1972 ADA House of Delegates resolved that the Inter-Agency Committee be continued for another year and that its "Guidelines for Teaching Expanded Functions" be tabled for additional comments and reported back to the 1973 House of Delegates.³

B. Expanded Duties and State Laws.

This section discusses changes which have been made in the state dental practice acts and discusses some of those issues which should be considered when attempting to assess the extent to which expanded duties are allowed. In this context, it should be mentioned that there is some

question about how aware dentists are of what their state act permits.

A random sample of dentists in Pennsylvania and New Jersey were surveyed to determine the extent to which they were aware of their state laws and the extent to which they utilized their auxiliaries as compared to what the dentists believed the law allowed.²¹ These two states were chosen because the Pennsylvania Act has permitted expanded duties since 1967 and New Jersey has yet to change its law. Dentists in Pennsylvania responded with less than 50% accuracy for tasks delegable to assistants (49%) and hygienists (45%). New Jersey dentists had a 45% accuracy rate for duties delegable to hygienists and 68% accuracy for assistants. When the dentists in both states were questioned on how fully they utilized their assistants within the scope of the law, dentists, to a large extent, believed they were delegating tasks as the law (as they saw it) permitted.

There seems to be a lack of communication concerning dental practice acts. Furthermore, when the presidents and secretaries of 21 state associations responded to a survey of their understanding of the scope of their state laws, these officials averaged only 82% agreement on allowable procedures.²¹ Communication between the state and the dentist is important and should be improved, especially since many states have changed their laws in recent years.

Conway describes an ideal law as being one which broadly defines the duties not assignable and which allows the state board to specify the tasks assignable to auxiliaries. Duties not to be delegated included: diagnosis, treatment planning, prescription (drugs and appliances), surgical procedures on hard or soft tissue, or any procedure which would

lead to immediate alteration of the oral cavity.¹¹

In 1967 the ADA House of Delegates passed a resolution that dental societies recommend revision of their practice acts to: (1) give examining boards authority to prescribe rules for more effective utilization of auxiliaries, and (2) to eliminate from their acts serial listings of functions to be performed by the hygienist.¹¹ In 1970 a survey of dental practice acts showed that nearly one-half (21) of the states had implemented revised acts to permit expanded functions for ancillary personnel.²³ These states are categorized into two groups which define expanded duties by (1) a list of allowable duties (11 states), or (2) by an "open" provision (10 states). In the 1972 study, 11 states are listed as having a list of duties and 19 as having open provisions.²⁴ Two states, Maine and Iowa, list duties for hygienists and have open mechanisms for assistants.

Johnson and Bernstein's "open" provisions are those which follow the guidelines of the 1967 ADA House of Delegates resolution, i.e., which generally exclude certain procedures but which do not otherwise limit the dentists' delegation of tasks. They give the following passage from the Alabama practice act as an example of an "open" provision:

"A competent Dental Assistant or Hygienist shall be permitted to assist the licensed dentist as he may direct while acting within the line and scope of such employment and under the direct supervision of the dentist.

"Under no circumstances may she perform any service such as diagnosis and treatment planning; surgery on hard or soft tissue; any intraoral procedure which would lead to the fabrication of any appliance or prosthesis; placing any final restoration; administering local and general anesthesia; or any other reversible procedures which may require the professional judgment and skill of a dentist."²³

Conway outlined the benefits of such provisions: the public would benefit from increased dental resources; the hygienist and the assistant would have greater opportunities for more rewarding work; the dentist would have better guidelines for assignable tasks; and the boards of dental examiners would be free to provide leadership in balancing dental resources with demand. On this last point, state boards usually define the roles of assistants and hygienists by lists of tasks under laws with open provisions. Most state dental boards are made up of members appointed by the governor. Almost all states require that the board members be residents/practitioners for three (Alaska) to ten (in many states) years and that they not be affiliated with any dental college or auxiliary training school. Terms of office range from three (North Carolina) to seven years (Michigan), with five years being the average term.¹⁵ Thus, state laws tend to exclude the younger and more liberal dentists from membership on the state examining board. Conservative state boards could greatly lessen the impact of open provisions by narrowly defining the auxiliaries.

As can be seen from the Alabama law cited above, one should not assume that an open provision will be more flexible from the start than a provision which lists duties. The Alabama law is restrictive by the number of duties it prohibits; on the other hand, several state laws which list traditional tasks for hygienists provide for additional tasks through rulings from the state board (e.g., Florida and Missouri). Under either the open or list provision, the benefit of defining the duties of the auxiliaries through rulings of even a conservative state board

rather than through the state dental practice acts is the comparative ease with which such rulings may be changed.

Both the 1970 and 1972 surveys are hampered by the fact that the difference between the provisions of the state laws and the rulings of the state boards is not distinguished. Thus in the 1972 study, New Hampshire is categorized as listing expanded duties for auxiliaries; in fact, the state act only generally defines what the auxiliaries may not do (an open provision), and gives the state board power to further define their tasks. The state board has issued lists of duties for the hygienists and for four classes of assistants. By not differentiating between the act and the board's rules, Johnson fails to point out the flexibility (or lack of) of the revised practice acts.

The 1972 study thoroughly describes state by state the provisions of the law and the rules of the board, but includes few comparisons except as described above. Several aspects of state laws and regulations should be examined in greater detail:

What expanded duties are allowable: In the 1972 survey expanded duties are defined as impressions for study casts, placement of rubber dams and matrices, and removal of sutures and dressings. The delegation of duties which are probably most critical to increased dental productivity are ignored: placing, carving, and finishing restorations. Examining 1972 survey listings of tasks for individual states it appears that none have yet approved the delegation of restorations. A study of restrictions of specific tasks would give a more realistic picture of the barriers to increased productivity through the use of EDAs.

The definition of the hygienist and the assistant: The 1972 study

mentions certain aspects of this problem but does not attempt to compare states.²⁴ Some laws refer only to "competent office personnel," others discuss dental hygienists and "other dental auxiliaries." Still other acts and regulations assign specific tasks to the hygienists and assistants.

There is great variety among states in whether expanded duties are extended to both the hygienists and the assistants. Johnson found that some states (Iowa and Maine) authorized expanded functions for dental assistants and left the old provisions for hygienists. In these states it would appear that the licensed and highly trained hygienist is barred from tasks performed by the lesser trained assistant. Some state boards have issued rules expanding the hygienist's functions, but the restrictive provisions of the state law have not yet been changed. Many dentists believe that hygienists should be restricted to the preventive field and Johnson found that in several states the traditional hygienist's duties are excluded from the assistants. Further study of the legal restrictions on the duties of the two types of auxiliaries might reveal important barriers to the delegation of tasks.

Certification of the assistants: Hygienists are licensed in all states, but the situation of the assistant is in question. It is clear from Johnson's 1972 study that many revised laws are including educational and certification requirements for the assistants. The degree to which states are allowing for the expanded duties for the large numbers of on-the-job trained assistants either through challenge exams or separate classification should be studied.

Supervision: In every state, auxiliaries carry out their tasks under the supervision of the dentist, who has the ultimate responsibility for this work. States vary somewhat in the extent of such supervision. Some states allow general (rather than direct) supervision for certain tasks (e.g. Florida).²⁴ The degree to which direct supervision is required could significantly affect the usefulness of the auxiliary.

Sex and Number Limitations: Most laws and regulations use the feminine gender when referring to the hygienist or the assistant and a few states still explicitly require that the auxiliary be female. In a 1967 ADA study on legislation affecting hygienists, ten states prohibited men from becoming hygienists (Alabama, Connecticut, Delaware, Indiana, Minnesota, Oklahoma, Rhode Island, South Carolina, South Dakota, and Utah).³ No doubt most of these provisions have been changed, though Johnson and Halz mention that "a very few states explicitly require that the auxiliary be a 'female person'."

Other states limit the number of auxiliaries to be employed by a dentist. The ADA study showed sixteen states (Arizona, Colorado, Missouri, Nebraska, New Jersey, New Mexico, North Carolina, North Dakota, Ohio, Oregon, Texas, Utah, Virginia, Washington, and Wisconsin) limited the number of hygienists to one. Five other states limited the number to two (Florida, Illinois, Kentucky, Nevada and Oklahoma).³ In neither the 1970 nor the 1972 survey is this restriction examined.

C. The Dental Nurse.

1. The Experience in Other Countries. The dental nurse program has been in operation in New Zealand for over 50 years, during which time the

dental health of the children of New Zealand has greatly improved. In 1923, the first year of the program, the school dental nurses pulled nearly as many teeth as they restored (78.6 extractions per 100 restorations); by 1970, extractions had been reduced to only 2.8 per 100 restorations. About 75% of the decayed teeth of the New Zealand children are restored compared to less than 25% of the cavities of the U.S. children.¹⁶

The dental nurse is limited to employment with the New Zealand Department of Health and treats children from the age of two and one-half to age thirteen and one-half. It appears that the program will not be expanded to include the children between fourteen and sixteen. Dunning points out that this group is presently referred to dentists for comprehensive care at the government's expense and that dentists like this program, in part because the government payments stimulate an easy transfer from clinic to private care.¹⁴

The typical district in the dental nurse program includes one dental officer and one or two nurses who supervise the work of 75 to 120 dental nurses caring for 35,000-60,000 children. Under this scant supervision, the dental nurse provides almost total care to the children. These tasks include: oral exams, prophylaxis, cavity preparation, placement and finishing of copper restorations in deciduous teeth and silver and silicate restoration for permanent teeth, and classroom education. The quality of care given by the dental nurses is generally viewed as being good to excellent. More complex tasks are referred to private dentists (e.g., extraction of permanent teeth, restoration of fractured incisors, and

orthodontic treatment).^{13,14} Many countries have or are developing a dental nurse similar to New Zealand's. These include: Malaysia, Ceylon, Singapore, Indonesia, Thailand, Australia, New Guinea, Great Britain and Saskatchewan province in Canada.¹⁶

2. The American Experience. There is some evidence that the dentists in the United States are ambivalent about expanded duties for the dental auxiliaries because they fear the development of a paraprofessional who will decrease the demand for the dentist's services. This fear was explicitly stated in the policy statement regarding the training and utilization of hygienists and assistants which was adopted by the ADA House of Delegates in October 1961.

- "1. Experimentation with the expansion of functions of both the dental hygienist and dental assistant is considered desirable and appropriate
- "2. Experimentation should not be designed to produce any type of auxiliary who might be considered to be a 'second level' dentist."⁶

In 1972 the ADA House of Delegates adopted a resolution that "development of new categories of dental auxiliaries is not accepted by the American Dental Association and that only the dental assistant, dental hygienist and dental laboratory technician are recognized as dental auxiliaries"⁷ Though not explicitly stated, this resolution seems to be another affirmation of the ADAs opposition to the concept of the dental nurse or such ancillary personnel as might be developed who would perform more complicated procedures with little control by the dentists. This idea is supported by the second resolving clause which reaffirms the Association's policy that "dental auxiliaries legally authorized to perform

intraoral procedures continue to be responsible to and work under the supervision of a licensed dentist who shall be physically present, consistent with state dental practice acts."⁷

The dental hygienist in particular appears to be overtrained for the tasks she now performs. For licensure most states require graduation from high school and completion of a two-year curriculum in dental hygiene. In 1972 the ADA Inter-Agency Committee recommended that the hygienist's duties be expanded to include certain duties traditionally performed by the dentist without any need for additional training. These recommended duties included restorations and local anesthetic. Such an expanded role for the hygienist could draw more women into the hygiene field and more rewarding work could significantly lengthen the work-life of hygienists. However, American dentists in the past have been resistant to the delegation of irreversible tasks and especially resistant to dental auxiliaries working outside the supervision of the dentist.

For example, in 1949 an effort was made in Massachusetts to introduce to the United States a dental nurse similar to those in New Zealand. In July 1949 the Massachusetts legislature passed a bill supporting a five-year study project of the dental nurse at the Forsyth Institute in Boston. This training and study project for fifteen dental nurses was approved by the state dental society and board of examiners. By October, however, opposition to the project was growing in the state, and at the annual ADA meeting that month, the national association voted its disapproval. In January 1950 a bill repealing the project was introduced by a group of dentists from the western part of Massachusetts and a

political campaign took place which culminated in repeal of the law permitting the experiment.¹³

IV. OPINIONS AFFECTING THE USE OF AUXILIARIES.

A. What Tasks are Dentists Willing to Delegate.

An expanded role for auxiliaries is indicated by the trend in revising state dental laws. These changes have prompted several state studies which examine the attitudes of dentists toward auxiliaries and especially what tasks they are willing to delegate. Studies of the opinions of graduates from two dental schools and the opinion of Army dentists are also included below.

Minnesota

The 1971 Minnesota survey has the highest response rate (93%) of the state surveys examined. The state dental law was revised in 1970 and 87% of the respondents felt the revisions were advantageous to the profession.³¹

On economic aspects, 92% of the dentists felt that an expanded duties auxiliary would allow them to provide more services and 68% felt that such an auxiliary would be financially advantageous. Among respondents age 30 and under, nearly 80% felt there would be financial advantages. Forty-eight percent of the age group 30 and under felt that they might be able to lower their fees, compared to 35% of all respondents.

Nearly 75% of all respondents felt they would hire an expanded duties auxiliary. Ninety-four percent of the dentists under 30 said they would be interested. When asked about supervision, 57% felt there would be considerable supervision required. Only slight differences were observed among the age groups. Eighty-five percent believed a continuing education course should be developed to train dentists to utilize the expanded duties

auxiliary (this survey was done two years before the TEAM program was begun at the University of Minnesota).

The Minnesota study examined dentists' attitudes toward only two expanded duties: placing restorations and cutting cavity preparations. Thirty-one percent felt the auxiliary should be trained to place restorations. The under 30 group again shows more positive attitudes toward the use of the auxiliary; 53% of this group favored such training. Only 17% of the respondents felt auxiliaries should be trained to cut cavity preparations.

Many people assume that dentists are reluctant to delegate tasks to auxiliaries because of adverse public reaction. However, 71% of the Minnesota dentists agreed that patients would accept services rendered by an auxiliary. Eighty percent of the under 40 dentists agreed with this.

Martins, et. al. did a sample survey of Minnesota dentists in 1969-1970.³² The results of this study were similar to those of McKinzie's larger study. Dentists were more likely to delegate reversible rather than irreversible procedures. The younger dentists and students were more willing than the older dentists to delegate all tasks; few dentists (about 20%) were willing to delegate the condensing and carving of amalgam restorations compared to about 65% of the dental students.

When asked to rank order solutions to a shortage of dental manpower, the dentists ranked the increased use of auxiliaries as the best solution. Ranked second was an increase in the number of dentists, third, increased emphasis on prevention, and fourth, increased public health measures. Dentists in cities of 10,000-100,000 ranked more dentists as fourth, in

sharp contrast to dentists from cities under 2,500 or over 100,000 who ranked this as the best solution. Dental students ranked increasing dentists as their fourth priority and increased emphasis on prevention as their second. The dental students agreed that increased use of dental auxiliaries was the best solution.

Another section of the questionnaire asked the dentists whether they believed dental manpower would be adequate in ten years. They barely disagreed with this statement, which seems to indicate that they do not see an increase in the demand for their services and may not see any need for expanding the duties of dental auxiliaries.

Georgia

The purpose of Waller's study was to determine whether Georgia dentists would favor a change in the state law to allow for greater utilization of auxiliaries and to project the potential impact of such changes on the dental services provided.⁴² This survey concentrates on tasks dentists would be willing to delegate. Nearly 77% of Georgia's practicing dentists responded to the questionnaire.

Waller divided the fifty tasks listed in the questionnaire into forty-one reversible and nine irreversible duties. The reversible tasks were found to be much more acceptable (40.8%) than the irreversible type (7.7%). The "definitely would delegate" response for reversible duties was highest for taking radiographs (89.1%) and lowest for cementing root canal fillings (1.5%). Anesthesia by infiltration received the greatest acceptance (18.5%) of the irreversible tasks and preparation of cavities with exposure of pulp had the lowest acceptance (2.1%). Dentists in the 21 to 34 age group expressed a greater preference for delegating reversible

tasks (43.2%). Dentists 55 years or older were more likely to delegate irreversible tasks.

Thirteen duties had an acceptance of 50% or higher. Waller compared these thirteen tasks to a list similar to those recommended for inclusion in the TEAM program. Eleven of the highly accepted tasks appear in the TEAM list. However, duties concerned with the placement or removal of restorative materials failed acceptance at 50% or higher, except for the placement of temporary fillings without pulpal involvement (60%). Dentists who exhibited the greatest acceptance for expanded duties have the following characteristics: 21 to 34 years old; a graduate of one to ten years; salaried; dental school faculty member; specialist; employs chairside assistants and hygienists; and had some knowledge of other research in this area.

Waller concludes that the changes approved by the Georgia dentists would have little effect on the amount of dental services available because dentists would still perform the procedures of filling cavities. This is consistent with the conclusion of Hill, et. al., that dentists consider the auxiliary's role to be one involving procedures preliminary to the actual task of filling cavities. In Hill's study, 27% thought a trained assistant could fill cavities.⁴²

Washington

Six months after the state law had been revised in 1971, a questionnaire on expanded duties was mailed to general practitioners, pedodontists and periodontists. These three groups were chosen because these dentists use auxiliaries in the ways described by the questionnaire. A 55% response rate was received.²⁵

As in the McKinzie and Waller studies, the younger dentists had higher percentages of positive responses to the delegation of expanded duties. Regarding restorations, the dentists under 30 had a higher affirmative response for allowing both the assistant (55%) and the hygienist (74%) to insert temporary fillings. The state law prohibits assistants from "any removal or addition to hard or soft tissues," so the questionnaire does not include condensing or carving permanent restorations for the assistant. When asked if they would delegate the condensing and carving of an amalgam restoration to a hygienist, 49-52% of the dentists under 30 replied affirmatively compared to 19-26% of those over 51 years old.

Responses were also sorted according to busyness of practice. For almost all procedures, dentists who were least busy were most in favor of expanded roles for auxiliaries. Perhaps a large portion of these are young dentists. Those dentists who used full-time assistants were least likely to report they were too busy to treat all patients requesting appointments.

North Carolina

This survey had a response rate of only 25%. However, the author assures us that the sample is similar to the overall state characteristics in terms of its specialty, geographic, and age distribution, and in terms of types and combinations of auxiliaries employed. The questionnaire asked dentists whether they would be willing to delegate to existing auxiliaries twelve specific duties required by the TEAM program.²⁷

Over 75% of the dentists would delegate seven of the twelve procedures. These functions include taking impressions for study casts, applying rubber

dams, oral health instruction, applying topical fluoride, finishing amalgam, resin and silicate restorations, and rubber cup prophylaxis. Between 50-70% would delegate preliminary oral exams, placing and removing temporary restoration and placing matrices. A minority of the dentists believed that an auxiliary should condense and carve an amalgam restoration (48%) or place resin and silicate restorations (38%).

The dentists in the North Carolina study agreed that an expanded duty auxiliary would increase productivity, free the dentist for more skilled jobs and help more patients. Thirty-nine percent believed their quality of work would increase and 53% believed their net income would increase.

Lindahl, et. al, conclude that the uncertainty and disagreement shown in their survey indicates a need for more experimental use of auxiliaries in expanded functions, particularly research into their use in the dental office of private practitioners.

Army Dentists

A recent survey of 699 Army dentists indicated a majority foresee a real need for EDAs (75%), that they expect to have such assistants in the future (75%), and that they would use EDAs if they were available (72%). The Army dentists also indicated they would be willing to delegate many tasks to an assistant. Among these are: placement of intermediate bases; the placement and finishing of amalgam, silicate and resin restorations; the placement and removal of periodontal packs; and the irrigation, drying and culturing of root canals. The dentists were reluctant to delegate treatment planning (3%), clinical exams (31.7%) and the administration of local anesthetics (15.4%).²⁰

Unlike the studies of civilian dentists, this study found that dentists with two or more years experience were more willing to delegate tasks than new graduates. Heid and Bair suggest that the differences between the health care systems may influence the dentists' opinion. The Army dentists feel a demand for their care through the regular screening programs and no doubt the lack of a financial barrier also increases the demand for dental care. Civilian dentists may not see an unmanageable demand for their services and so see no need to delegate tasks.

Tufts University

This study, discussed in Section II, is principally an evaluation of the DAU program. However, some analysis was done of tasks assigned to the assistant. In this study, the percentage of dentists who believed they practiced four-handed dentistry was larger than the percentage who actually assigned such tasks. Of dentists who employed one full-time auxiliary, 80% believed they practiced four-handed dentistry but only 57% actually assigned four-handed tasks.³⁹

Part of the survey of Tufts' graduates dealt with the effect of the practice setting on the employment and use of auxiliaries. The largest group of dentists in this study employed one full-time assistant. They expected the assistant to spend less time in chairside tasks (47%) and infrequently employed receptionist-secretaries or laboratory technicians. Dentists with two or more dental assistants had well established practices which delivered services to a large group of patients. They also tended to be in group practice or partnerships rather than in solo practice (59% to 41%). These dentists preferred a formally trained assistant and

assigned a greater proportion of her time to chairside assisting (61%). These dentists also employed more laboratory technicians and hygienists. The third group of dentists employed a single part-time assistant, expected her to spend over one-half of her time in chairside assisting (54%), had a small office, a less well-established practice and limited use of other auxiliaries.

University of Michigan

Brown suggests that there may be psychological factors which influence the use of auxiliaries, with expanded duties or not.⁹ Dentists in his samples (University of Michigan classes 1955, 1959, and 1965) had the following characteristics: preferred working with things rather than people, disliked conflict with people, preferred to do a job themselves rather than delegate it, disliked supervisory or managerial activities and disliked business details. The dentists preferred manual, scientific and artistic activities.

Brown concludes that increased use of auxiliaries would be both pleasurable and painful to the dentist. He would be pleased to delegate business and clerical duties since these are not interesting to him. He would be less likely to delegate technical tasks because he enjoys these duties. Brown concludes that dentists' lack of interest in supervising and delegating technical procedures will hamper the full utilization of the EDA.

The consensus of the surveys examined is that dentists believe the roles of the auxiliary can and should be expanded. In regard to specific tasks, dentists are more willing to delegate preventive or reversible tasks than irreversible ones. Especially important is their refusal to delegate restorations. Younger dentists are generally more willing to

delegate all procedures. These statements do not apply to the Army dentists surveyed, probably because of the difference in setting.

An interesting study would be to sample the dentists who say they use EDAs and examine their actual delegation rather than opinions. If what the Tufts study indicates is true, what the dentists believe they would delegate may be quite different from their actual practice.

B. Will EDAs Lower the Quality of Care.

Some dentists claim that they cannot delegate certain tasks to assistants because this would lower the quality of care. This fear is not substantiated by several experimental programs discussed in the Introduction. The results of these studies will not be reiterated here, except to briefly describe the training of and quality of work by EDAs.

The experimental programs varied in the amount of training or experience of EDAs. The Louisville and Minnesota studies used assistants who generally had formal training and at least one year experience and received one year additional training in expanded duties. The University of Alabama program gave two years of training to carefully selected high school graduates. The assistants in the U.S. Public Health Service were given eight to twelve weeks of training. The Assistants in the Great Lakes Naval Center were given a five-week course in expanded duties when they had finished a technician course.

In all of these programs the quality of the EDAs' work was as good or better than the dentists'. EDAs in the Louisville Center were found to require more time to complete procedures than dentists; however, in Philadelphia both the quality and quantity of work by EDAs exceeded that

of dentists.

C. Will the Public Accept EDAs.

Possibly dentists are reluctant to delegate more tasks to auxiliaries because they do not believe that the public will accept services from any person other than the dentist himself. The two following studies examine public reactions to the delegation of prophylaxis and x-rays.

In O'Shea and Cohen's 1968 study, 32% and 24% of the patients reported that an ancillary person took x-rays and did prophylaxis.³⁵ These patients expressed satisfaction with the treatment received (94% and 93%).

Of those patients who had not received treatment from an auxiliary, the majority indicated they would be satisfied if these duties were delegated to a trained auxiliary. Twenty-five percent said they would not be satisfied if the taking of x-rays was done by anyone other than the dentist. Thirty-seven percent indicated they did not believe they would be satisfied with having an auxiliary clean their teeth.

The authors conclude that public resistance to EDAs can be quickly overcome by adequate performance by the auxiliary. The public's expectations are not as rigid as may be thought, and are largely determined by past experiences.

Rayner compared the opinions of the public and the opinions which dental students and hygienists believed the public would have.³⁷ She found that the dental professionals believed the public would prefer the dentist above all others to do their prophylaxis or take their x-rays.

The author cites the O'Shea and Cohen study discussed above as proof that the public will accept the delegation of x-ray and prophylaxis.

These two studies indicate that patients will accept the delegation of duties and that the real problem may lie in the profession's reluctance to accept this view. Certainly in the experimental studies of EDAs examined earlier, the quality and public acceptance of the work by EDAs was high.

V. SUMMARY.

This paper has reviewed the literature on the use of dental auxiliaries. The dentist may increase his productivity by employing more auxiliaries and by delegating more tasks to them. State laws and rules are becoming more liberal in allowing the dentist to delegate tasks to his auxiliaries. Still, some restrictions on the use of hygienists and assistants remain, and especially most revised laws or rules do not allow the delegation of restorations. Surveys of dentists have shown that while they appear to be receptive to the use of EDAs, they are resistant to the delegation of restorations. Brown's psychological study indicates that dentists may resist delegation of technical duties because the dentists enjoy performing them.⁹ Others have suggested that dentists hesitate to delegate tasks because they believe that the public would not be receptive or that the quality of care would suffer. Neither of these fears have been supported by research. Perhaps the views of dentists will change as more of them are exposed to the TEAM program, but this will require time.

Johnson and Bernstein's 1970 study of state laws indicated that the states which had provided for expanded duties had less favorable

dentist/population and hygienist/dentist ratios than states which had no such provisions. The states with revised laws and rules had an average dentist/population ratio of 39.7/100,000 compared to 42.2/100,000 in the other states. The average hygienist/dentist ratio in these states was 12.2/100 compared to 16.7/100 in states without revised laws. It appears that more demand per dentist in some states has increased the dentists' willingness to delegate tasks.

Williams' study is supportive of this notion.⁴⁴ His survey of the dentists in the Boston metropolitan area examined factors which influenced dentists' desire to expand their practices. Twenty-seven percent of the dentists wanted more patients, 17% wanted fewer, and the remainder were satisfied with their practices. Fifty percent of all the dentists said that they would be willing to hire additional personnel if faced with heavy demand. Most of the dentists chose this option over working longer hours.

It may be that only when faced with an acute increase in demand for their services will dentists be willing to increase the quantity of auxiliaries used and to delegate more duties to them. This assumes that the dentists will not be willing to work substantially greater hours in response to increased demand; Table 1 in the Introduction shows that this has been the case in the past.

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